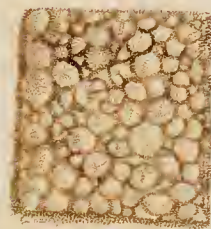




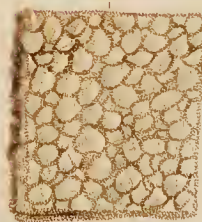
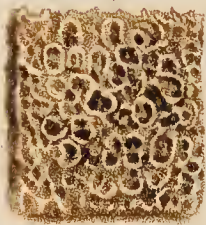
Nº 1



External

Internal

Nº 2.



External

Internal

Cocoons of the Medicinal Leech.

FURTHER OBSERVATIONS
ON THE
MEDICINAL LEECH;
INCLUDING A REPRINT,
FROM THE PHILOSOPHICAL TRANSACTIONS,
OF
TWO MEMOIRS,
COMPRISING
OBSERVATIONS ON THE *HIRUDO VULGARIS*,
OR COMMON RIVULET LEECH;
AND ON THE
H. STAGNALIS AND *H. COMPLANATA*,
NOW CONSTITUTING THE GENUS
GLOSSOPORA.
(WITH ILLUSTRATIVE ENGRAVINGS.)

BY
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TO
SIR EVERARD HOME, BART.

V.P.R.S. F.S.A.

SERJEANT-SURGEON TO THE KING, &c. &c.

TO WHOM SCIENCE STANDS GREATLY INDEBTED FOR SEVERAL
VALUABLE CONTRIBUTIONS TO

COMPARATIVE ANATOMY AND PHYSIOLOGY,

The following Pages,

COMPRISING

ADDITIONAL FACTS AND OBSERVATIONS ON THE
MEDICINAL LEECH,

ARE

(WITH HIS PERMISSION)

VERY RESPECTFULLY INSCRIBED.




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PREFACE.



AT the time of my former remarks on the MEDICINAL LEECH being put to press, I could not but regret that the Natural History of so highly useful an animal, and one which, in many distressing diseases, constitutes our chief, and I may say, only remedy, should be still enveloped in such obscurity. This regret, now, no longer exists—this part of the subject having received the most satisfactory elucidation, in a Memoir, recently published, by Dr. Noble, resident Physician at Versailles.

The Medicinal Leech is, according to the Doctor's report, *oviparous*. Of this, doubts had been for a long time entertained; the majority of those who had written upon the subject, being decidedly of opinion, that the Leech was *viviparous*—an opinion, which, however at variance with the above, will, I hope, be reconciled, in the course of the following pages.

The ova, it appears, are imbedded in a gelatinous mass, and contained within a bag of a spongy-like

texture, which in size and figure bears no unapt resemblance to the Cocoon of the Silk-worm. One of these Cocoons, which Dr. Noble had the kindness, agreeably to my request, to forward me by my friend Mr. Jos. Hall, jun. of this city, is represented in the engraving annexed to his Memoir, in the interior of which are exhibited two young Leeches.

Upon my shewing this Cocoon to Mr. Clift—the worthy and intelligent conservator of the Museum of the Royal College of Surgeons, in London—he gave me to understand, that similar Cocoons had been presented to the Museum some years back by Mr. Dickson; to whom, it may be recollected, I applied for information, previously to publishing my former observations—but, for what reason I cannot divine, he thought proper to decline giving me an answer. Had he but then acted with common courtesy, and communicated this information, the present work would never have been put to press.

It is singular, that I should, after this lapse of time, profit by his labours—being now under an obligation to Mr. Clift for sketches of those very Cocoons he presented to the Museum, which are delineated, in coloured figures, in the frontispiece. In No. 1 and 2, the Cocoons of the Leech are represented of their natural size, shewing their external and internal

structure, with detached portions, as they appear when under the microscope.

Mr. Clift, in his letter now before me, after remarking that his search had been ineffectual in finding the memorandum deposited, at the same time, by Mr. Dickson, with these Cocoons, and that he had, according to my request, laid open both pods, but found nothing within them, says, "I do not know what to think respecting the pods belonging to different species of Leeches, for No. 2 bears a very strong resemblance to the inner part of No. 1, and if the outer or sponge-like part were removed from No. 1, it might certainly be mistaken for a specimen of No. 2. They have both of them a smooth internal surface, although they appear honeycombed, but that appearance is occasioned by the inner membrane being thinner at those parts, and the light shining through, between the reticulated external flocculent covering. I have had a recent specimen of No. 1 brought to me a week since by a friend, who met with it, in a small pond, in his garden near Islington. It was the only one he found, although he made a very careful search. It is probably rather late in the season, as, he tells me, there are thousands of Leeches, about half an inch in length in his pond, being the young of the *Hirudo Sanguisuga*. This Cocoon is

like that represented in No. 1, only making allowances for the difference produced by drying, which rendered the dry one more transparent, and thinner in its coats. The recent Cocoon was quite turgid with a white curd-like substance, which readily dissolved in water ;—but there was not the least appearance in it of any thing oviform, or in the shape of young Leeches.”

The Cocoon I received from Dr. Noble, which is represented in the engraving immediately succeeding his Memoir, is of larger size than those delineated by my friend Mr. Clift ; but if the conjecture be correct, of these Cocoons being formed around the external part, coating as it were the body of the Leech, their size must of course depend upon that of the animal itself, being greater or less, as the Leech is more or less replenished with food. The Cocoons also differ in colour—as is evident in those delineated—probably produced by the nature of the soil in which the Leeches are imbedded.

After perusing the Memoir transmitted me by Dr. Noble, I had some idea of putting to press a second edition of my “ Treatise on the Leech,” embodying in it a translation of the above, with such additional facts as I had since been enabled to collect. It, however, afterwards occurred to me, that it would prove

more advantageous, both to myself and purchasers of my former work, if I brought it forward in a separate publication. And to this I have been the more induced, from its being likely to afford me, in the event of another Edition being required, an opportunity of procuring two continental works, which I have not yet seen, published on the Medicinal Leech, since my previous observations were put to press; one by Dr. Kurzmann, Physician to the King of Prussia—the other by Professor Carena, being an interesting monograph on the genus, *HIRUDO*. The few remarks by these Authors, here and there interspersed in the following pages, are such as have been furnished me, by the perusal of the critiques on these respective publications, in Brewster's Journal of Science, and the London Medical and Physical Journal.

In the present publication I have availed myself of two Memoirs (illustrative of the natural habits, &c. of the *Hirudo vulgaris*, or Rivulet Leech,—and of two or three other species, formerly included under the genus *HIRUDO*), originally published in the Philosophical Transactions; the President and Council of the Royal Society having not only granted me permission to reprint them, but with a liberality, it were

uncourteous to pass over in silence, allowed me to take as many impressions from their plates as would be requisite for my present purpose.

A work, published many years back by a French author of the name of Vitet, recently fell into my hands, which I had before been vainly endeavouring to procure. From so bulky a volume, consisting as it does of nearly six hundred pages, I naturally expected to glean considerable information: in this I was much disappointed, the greater portion of the work being occupied in minutely detailing the effects of several experiments upon the Leech, (of which I have given a condensed tabular view) and in describing the numerous diseases, in which this useful animal has been recommended; the Natural History of the Leech, that part to which I have more immediately directed my attention—it never having entered into my plan to discuss the merits of the Leech in the cure of disease—being but slightly touched upon. It is but fair to confess that the anatomical description has been given with great fidelity, and such remarks as are new, or have been unnoticed in my former work under this head, will be found in the Appendix.

I cannot conclude without directing the attention of those who affirm that I have been unprofitably spending my time, in pursuing, what they deem an

insignificant subject, to the following passage from an ancient author; trusting they will, for the future, entertain a more liberal and enlightened opinion.

“ *Viliorum animalium disquisitionem atque inspectionem spernere, indignum esse Philosopho, cum nulla res sit naturæ, cui non insit aliquid mirabile.*”

BRISTOL, JULY 27th,

1825.

Observations

ON THE

MEDICINAL LEECH;

BEING A TRANSLATION, FROM THE FRENCH, OF A MEMOIR, READ
BEFORE THE CENTRAL SOCIETY OF AGRICULTURE AND THE
ARTS, IN THE DEPARTMENT OF THE SEINE AND
OISE, 6TH MARCH, 1822,

By M. NOBLE, M.D.

SENIOR PHYSICIAN OF THE HOSPITAL AT VERSAILLES, MEMBER OF THE
ABOVE SOCIETY, &c. &c.

LEECHES are so frequently employed, and render such essential service in Medicine, that every thing connected with their natural history cannot but excite interest. Under this impression, I had the honour of communicating verbally to the Society in September last, a fact which appeared to me to throw some light upon the manner in which they bring forth their young—a subject hitherto enveloped in great obscurity.

The Society had not only the kindness to receive this notice favourably, but begged I would continue my researches, and bring forward all the facts I could collect bearing on this point. In compliance with the wishes then expressed, I now lay before them the present Memoir.

Leeches, as before stated, are in frequent demand. Their employment—from our increasing knowledge in Morbid Anatomy and Physiology enabling us to ascertain with greater precision the nature and seat of disease—is become at present very general, particularly in Hospital practice. They may readily be procured during the summer, excepting in times of great drought, at a moderate price. This is not the case in winter. During this season, it not unfrequently happens, they become exceedingly scarce, and can then only be purchased at a high rate. To remedy this inconvenience, it has been hitherto the custom, to

procure them during the autumn, depositing them in large numbers in vessels of greater or less size. But notwithstanding the frequent renewal of the water, great mortality is experienced, and this at times is so considerable as to occasion great pecuniary loss.

One of the chief causes producing this mortality, must doubtless be referred to the combats in which they engage, for the purpose of procuring that supply of food, which it is impossible they can find, when brought together in large number, and in vessels of small size—combats, in which the weakest become a prey, and serve as food for the strongest.

With the view of preventing as much as possible these accidents,—of protecting the Leeches from those diseases which destroy them so rapidly, of guarding them from the inclemency of the winter, and affording them greater liberty, the matron of the Royal Hospital of this city (a woman as distin-

guished by her zeal as by her other estimable qualities) to whom I had previously imparted my ideas, gave directions for the construction of a reservoir, which was to have a southern aspect—to be sheltered on the side exposed to the north, and supplied with a current of fresh water. It was so contrived that it could be quickly filled or emptied at pleasure. It was about seven feet in length, three in breadth, and as many in depth. Its sides were sloping, and thickly coated with slime or mud, which, as we shall presently have occasion to notice, proved of no small importance.

To enable the Leeches to retire to a shady spot during the intense heats of summer, the borders of this reservoir were surrounded with turf, and a few rushes were planted in one of its angles.

In the month of November, 1820, we placed in this reservoir, about two thousand Leeches of the species known under the

name of the grey and green Leeches, where, as we had anticipated, they passed a very severe winter, without sustaining any sensible loss.

As soon as the cold became considerable, we remarked that they buried themselves in the mud—reappearing only when the sun's rays warmed the atmosphere.

About the end of the spring we began to notice some young Leeches adhering to the back and belly of the parent Leeches, swimming about with them, and detaching themselves from time to time, as if to try their strength. To the advantage, therefore, of keeping the Leeches in good health, we were certain of adding that, not less important, of their reproduction. We now commenced our observations.

During the month of August, in collecting some Leeches for medical use, we observed conical-shaped excavations in the slime, on the sides of the reservoir. In each

of these—the sides of which were smooth and compact—we found a small Cocoon, resembling, in size and figure, that of the silkworm. They presented, as you may have already remarked in those I had the honour of laying before you, the same appearance and density as a piece of fine sponge.

The Matron ordered several of these Cocoons to be collected, which were placed in a bottle filled with water. Upon opening them, several were found empty, their cavity presenting an exceedingly smooth, compact, and polished surface, as if coated with varnish. At each of the extremities we noticed a small aperture. Other Cocoons of less size, not appearing to be completely finished externally, were filled with a kind of transparent homogeneous jelly. In each of the remaining Cocoons, we found from nine to fourteen young Leeches, apparently in different stages of growth. It may not be unworthy of remark, that this degree of in-

crease in the size of the Leeches, seemed to correspond, exactly, with the greater or less development of the tissues or coats forming the body of the Cocoon.

In a few days, we perceived that the young Leeches had issued from the Cocoons in the bottle, and were swimming freely about in the water it contained.

Having withdrawn those Cocoons that were now become empty, we found the Leeches to have effected their escape by a small aperture formed in the Cocoon at each extremity. These openings, into which we could scarcely introduce a pin, traversed, in an oblique direction, the membrane of the Cocoon; the internal being larger than the external orifice:—the latter, unless closely inspected, being readily confounded with the cavities here and there observed in the external part of the Cocoon. The internal surface, as I have already noticed, was furnished with a layer of compact shining

dense matter, seemingly of a mucilaginous or rather albuminous nature.

In the beginning of September, about twenty of these Cocoons were again collected: some large, some small;—but on discovering by their weight, that they contained young, we placed them separately in bottles, the better to observe them.

At this period I presented some of the above to the Society, in which we still found several Leeches:—others had even escaped from the Cocoons, during their conveyance from the Hospital to the Society, and were still living in the paper which had served as an envelope.

A few days after placing the Cocoons in the bottles, we had an opportunity of witnessing the Leeches proceed from them, and remarked that those which issued from the large were stronger and more numerous than those from the small Cocoons; the latter not exceeding the size of a strong

sewing thread. These require, as we have since ascertained, a longer time to rear, and are, consequently, not so advantageous as the grey Leeches, which in the course of a few months had increased to, at least, full four times their size.

During the month of September, I again collected several of these membranous Bags or Cocoons. Two, which were opened, were found filled with the same gelatinous matter to which I have before alluded, but darker in colour. One, which I preserved at my own residence, was found to be pierced at each extremity; three small Leeches had issued from it—but a fourth, unable to effect its complete deliverance, lay dried up in the very aperture.

I have never yet been enabled, notwithstanding my frequent endeavours, to observe a Leech in the act of fabricating its Cocoon around the gelatinous matter we have found in some, and in which, I think,

lie imbedded the germs or rudiments of the future Leech—for, as soon as the Leech enters into the conical-shaped holes it has worked out in the mud, the water becomes turbid, and thus all its after-operations are concealed from view. I intend renewing my observations, and for the purpose of watching the Leeches more frequently, and I trust with better success, shall place them in a bottle partly filled with clay.

M. Brosset, apothecary at Bourgoïn, affirms, that he has witnessed Leeches *in actu coitus*—but he does not mention how this operation took place. We may, however, whilst upon this subject, remark, that Leeches retire to the bottom, or remain immoveably fixed to the sides of the vessel in which they are placed, upon hearing the least noise—and that, even when at full liberty in a spacious reservoir, the water, from being constantly agitated by their continual motion, is never in a state sufficiently

clear to allow of our noticing what passes. We are, therefore, led to believe, that the mode in which it is accomplished, will not, for a long period, be fully and completely ascertained.

It is, as I have before remarked, highly necessary, that the sides of the reservoir in which the Leeches are contained, should be well and amply furnished with clay. The utility of this substance is sufficiently obvious—for when the cold sets in, these animals plunge into the clay, and there, in some sort, lie buried as long as the frost continues. By this simple precaution, Leeches are enabled to withstand the greatest degree of cold. We are also in this way furnished with an easy and ready method of collecting them, by at any time raising up a portion of the mud or clay in which they lie imbedded.

From the above statement we learn the very remarkable fact—which I have never

yet seen described in any work of natural history or of medicine I have consulted—that nature, ever provident, has endowed Leeches with the means of securing the product of their fecundation from injury, by a protecting envelope—a sort of tissue or rather felt, exactly resembling fine sponge. This envelope would seem to be composed of some animal substance, probably the mucus so conspicuous on the surface of the body of Leeches, and which at certain periods becomes excessively abundant.

This increased quantity of mucus has been regarded by M. Brosset, as one of the three diseases, to which, according to him, Leeches are subject. But I am ignorant of the ground upon which he establishes this opinion—whether he regards this mucus as the cause, or only the effect of a disease, which he honours with the name of Epidemic, and which, he assures us, is peculiar to Leeches. Until, however, he has explained this, may

we not be permitted to believe, and with greater reason, that the increase of that mucus with which Leeches are continually coated, only becomes remarkable at the period nature points out for perpetuating their kind?

Immediately after the perusal of the above Memoir, M. de Plancy, a Member of the Society, remarked, that the existence of the Cocoons of the Leech had been for a long time known in the department of Finistere. He gave us afterwards to understand, in a Memoir read at the following meeting of the Society, that it was by means of these Cocoons, the Leech dealers in Bretagne, and particularly in Finistere, replenished, with Leeches, the ponds destined to furnish the metropolis with a great part of the Leeches there employed. About the month of April or of May, he informs us, accord-

ing to the nature of the season, they send out labourers, provided with spades and baskets, to the little muddy marshes, where they are known to exist in abundance. These workmen then set about removing those portions of mud that are known to contain Cocoons—such as have been exhibited to you—and which are afterwards deposited in sheets of water previously prepared for their reception. Here the young Leeches are allowed to quit them, but are, after an interval of six months, withdrawn, for the purpose of being conveyed to larger ponds. Horses and cows are then driven in to feed on the margin of these ponds, (doubtless with the view of affording the Leeches nourishment, and still furthering their growth) and in twelve months from this period the Leech-dealers begin to collect them for Medical use.

From experience it would appear that Leeches do not multiply in abundance, un-

less they have previously sucked the blood of animals—particularly that of cows.

I may here just remark, that Leeches, deriving in this way an abundant supply of rich nutritive aliment, become stronger and more vigorous, consequently better fitted for reproduction. I may also add, that if the capillary vessels in the skin of cows are more superficial, and the epidermis less tough than in that of horses, Leeches may be enabled to obtain, and with greater facility, sustenance more favourable to their nutrition.

These important facts—so strongly confirmatory of those advanced in my own Memoir—were communicated to M. de Plancy, by an individual, who, among other occupations, has trafficked for the last twenty-five years in Leeches, and who procures them all from Bretagne. Similar facts have also been brought forward by M.

Mouton, jun. a Leech-dealer in Paris, who has for a long period been engaged in this kind of commerce, and who derives all his Leeches from the same quarter.

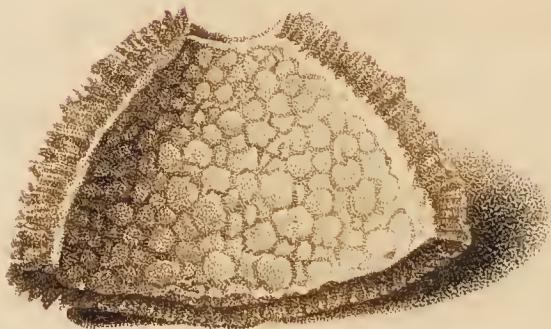
Fig. 1.



Fig. 2.



Fig. 3.



OBSERVATIONS

ON THE PRECEDING MEMOIR.

THE long disputed question, as to whether the Medicinal Leech is oviparous or viviparous, may be now considered as satisfactorily set at rest. It is in fact oviparous—that is—it produces a Cocoon, similar, in size and figure, to that of the silkworm, in which are imbedded, in a gelatinous mass, the ova or rudiments of the future Leech.

One of these Cocoons, for which I am indebted to the author of the preceding Memoir, who was so obliging as to send it me, is represented, of its natural size, in the accompanying engraving, Fig. 1. In Fig. 2, it is laid open, exhibiting in its interior two

young Leeches. Little or no gelatinous matter having been found within the cavity, it is but reasonable to presume, that the rest of the young had effected their escape by the aperture or point, at each extremity—the Cocoon usually containing, according to the Doctor's report, from nine to fourteen Leeches. In Fig. 3, we have a small portion of the upper extremity of the Cocoon, as it appears under the microscope, shewing its reticulated or honey-combed structure.

Notwithstanding the satisfactory statement of the Medicinal Leech being *oviparous*—as set forth in Dr. Noble's Memoir—yet are there individuals of great and acknowledged celebrity, who think, and have strong grounds for so doing, that the Leech is *viviparous*.

To the observations of Durondeau, Thomas, &c. already noticed in my former pub-

lication*, I may now add those of Dumeril and Dillenius. The former positively affirms that Leeches bring forth their young in a living state†,—and the latter—who possessed some Leeches which had been taken in September, that he one day noticed in the vessel some very small Leeches, so small indeed as to induce him to suppose they were born there, and that these animals are viviparous‡. Dr. Kurzman, a still more recent writer, is of the same opinion: he says, that he has seen young Leeches appear so suddenly—the day before not the least traces of them being found, and the water being frequently renewed—that it was next to impossible, they could proceed from the deposition of ova in the vessel that

* A Treatise on the Medicinal Leech, including its Medical and Natural History, with an Account of its very singular Anatomical Structure.

† Zoologie Analytique. P. 298.

‡ Ephemerides des curieux de la Nature, 1719. P. 346.

contained them*. These varied statements serve but to strengthen the opinion formerly advanced—that the Medicinal Leech is, under certain circumstances, both *oviparous* and *viviparous*. I have already taken notice of a few animals that bring forth *both eggs and living young*—such as the *Aphides*, *Musca Carnaria*, common Wood-louse, &c. I have now to remark that Virey, after giving a full account of the *Ascaris Lumbricoides*, observes, that these animals are *commonly oviparous*†. The *Gordius Aquaticus* has also been stated, upon good authority, to be both *oviparous* and *viviparous*‡. And it would appear from some observations communicated to the Institute of France, by M. Geoffroy St. Hilaire, and which has been noticed in one of our Medical Journals,

* London Medical and Physical Journal, Vol. XLI. p. 312.

† Journal de Physique, t. 4, p. 427.

‡ Memoires Acad. Turin, 1788.

that he has, by certain methods, rendered *oviparous* animals *viviparous*. He observes that Water-snakes (*Couleuvres aquatiques*) “when placed in a dry situation, and one unfavourable for depositing their *eggs*, retain them so long in the genital receptacle, that at the end of a certain period, the young burst forth from the egg, and leave the body of the parent *in a living state*.” It has likewise been observed, in reference to the Polype, that independent of its usual mode of propagation—that of throwing off shoots or buds after the manner of a plant—it *sometimes*, during the autumnal season, deposits *eggs*, which evolve themselves, afterwards, into distinct animals;—it thus possesses, as is also the case with the PLANARIÆ*, in common with the animals above alluded to, *a double mode of perpetuating its kind*.

* Vide Philosophical Transactions, 1822, p. 437.

If the supposition be not admitted of the Leech, being at times, both *oviparous* and *viviparous*—and I cannot conceive why, when it is well known other animals are thus circumstanced, it should be considered at all improbable with respect to the Leech—if this supposition, I repeat, be not admitted, we have only one other way in which we can possibly account for the presence of small Leeches in vessels where the parent-animals are confined, without allowing these creatures to be viviparous—*viz.* that as the young, in the earlier stages of their growth, affix themselves to the body of their parents—acting in this respect like the young of the GLOSSOPORÆ—they may, thus attached, be placed in bottles with large Leeches, and not excite our immediate notice;—and this I think the more likely to happen, if the young are but recently disclosed, or only a few adhere to the maternal Leech.

Upon a careful review of the statements

brought forward on each side of this question, I feel fully persuaded, that the Medicinal Leech is both *oviparous* and *viviparous*—and although the usual and common mode of perpetuating its race be *by Cocoons*, inclosing the ova of the future Leech, yet in those instances where the proper nidus is wanting, wherein they may be safely deposited—it will, I think, be found to produce *its young alive*. The very rare occurrence, however, of this latter fact, which may, by many, be supposed to militate against this opinion, is sufficiently accounted for, by the knowledge, that Leeches have been seldom witnessed, in confinement, in that state so absolutely necessary to their proving prolific.

Of the manner or mode in which these Cocoons are fabricated, Dr. Noble can give us no account.—But from what is stated, in the accompanying Memoir, on the mode of propagation of the *Hirudo vulgaris*—from

the analogy in structure between this and the Medicinal Leech—and from the apertures observed at each extremity of the Cocoon, it would, I think, appear that they are formed and deposited precisely in the same way as the capsules of the *Hirudo vulgaris*, or common rivulet Leech.

In reference to the great mortality occasionally observed among Leeches, which Dr. Noble and others attribute to the combats in which they engage to procure sustenance, when the weakest, as they affirm, are compelled to yield and furnish food to the strongest, I may remark, as it respects the Medicinal Leech, that this assertion is altogether founded in error. Although Leeches are observed to be particularly fond of red blood, yet they do not, it seems, take indifferently that of every animal, since they refuse to attach themselves to the Earth-worm. The blood of their own species seems equally unheeded by them. This, however, it has been

remarked, does not destroy the fact observed by M. Vauquelin, that hungry Leeches will attack those gorged with blood. As far as I have myself had an opportunity of noticing Leeches, I have never known a single instance where they attacked any of their own species, or those of the genus to which they belong. But what is most conclusive upon this point is, the observation of M. Vitet, who affirms, so far are the Leeches from biting or destroying, that they even caress each other! Those, he says, who have stated they have seen hungry Medicinal Leeches affix themselves to the most feeble, could have only imagined it:—for during the whole time he preserved Leeches—a period of forty years—he has never known an instance to occur, however voracious they may have been, in which one has wounded another. To determine still more accurately this point, he took a Leech, and made an incision into the internal cavity.

As soon as the blood began to escape, he placed it in a vessel, filled with water, in which were previously inclosed four vigorous yet hungry Leeches. Although the blood was still flowing, its companions, so far from attaching themselves to the wounded Leech, appeared rather to shun it, removing to as great a distance as possible. On the ninth day—the water in the interim being frequently renewed—the Leech died, yet during the whole of this period, the other Leeches were never seen to attack it; hence it has been falsely stated that healthy and greedy Leeches attach themselves to those which are wounded, for the purpose of sucking their blood*.

This propensity, it must be admitted, is but too common with the Horse-Leech, (*Hirudo sanguisuga*) to have escaped notice. This creature, as before remarked, will not

* *Traité de la Sangsue Medicinale*, p. 75 and 174.

only destroy the Medicinal Leech, but even the weaker of its own species :—its voracity indeed can scarcely be credited. I have frequently cut into strips a dead Leech, which they have devoured—drawing it into the stomach by suction alone—with the greatest readiness. Earth-worms, shreds of meat—*either roast or boiled, for unlike epicures, nothing comes amiss to them*—are seized upon with equal avidity. I one day took a pellet of fresh bread, and gave it the shape of an Earth-worm, which was as eagerly swallowed as if it had been the original animal. The combats in which the *H. sanguisugæ* engage for food, are frequently very desperate, and no doubt gave origin to the belief, that the Medicinal Leech was equally fond of this now-a-days refined amusement.

I cannot close these remarks without noticing a fruitful source of error in works of Natural History ;—that of taking the cha-

racter, or I should rather say the history of an individual species, for that of the whole genus—no two animals, although alike in external appearance, can possibly differ more in their general habits, than the Horse and the Medicinal Leech.

The error into which Dr. Shaw has fallen, in stating that the Leech, like the Polype, is enabled to repair deficient portions when cut asunder, probably took its rise in this way. The *Planaria nigra*, which I believe was originally described as a *Leech*, is known to possess this property in a remarkable degree. From this very circumstance, I have no doubt, the erroneous statement of the entire restitution of Leeches, when divided into two or more portions, must have originated.

OBSERVATIONS

ON THE MODE OF PROPAGATION OF THE

HIRUDO VULGARIS,

OR RIVULET LEECH.

Read before the ROYAL SOCIETY, November 14, 1816.

STRONGLY impressed with the conviction that every attempt to elucidate any part of natural history, will meet with a favourable reception, I have ventured to submit to the notice of the Royal Society, a few observations relative to the mode of propagation, &c. of the *Hirudo vulgaris*.

This little animal (Fig. 1, 2.) is found in great abundance in rivulets, attached to the under surface of stones, and in those situations where it is little exposed to

the action of the current. It varies as to its length, from an inch to an inch and a half, is of a dark brown colour on the back, marked with numerous transverse lines, but of nearly one uniform colour on the belly, chiefly that of a yellowish green. A central line of a black colour passes both on the back and belly, from the head to the tail. The ground colour, however, differs, hence several varieties have been enumerated.

From the circumstance of its having eight eyes, which are delineated, magnified, in Fig. 4, it has been denominated by LINNÆUS and others, *Hirudo octoculata*; but the *Hirudo tessulata* presenting an equal number of eyes, we shall give the preference to the name under which we find it described in MULLER, that of *Hirudo vulgaris*.

It appears, from the statement of an eminent naturalist, lately deceased, that this animal possesses the power of reproduction

in almost an equal degree with the polype : but the experiments I have hitherto made, by no means establish this point.

In its structure the *H. vulgaris* closely resembles the *H. medicinalis*. At the extremity of the tail we find the *anus*. There are four vessels destined to convey the circulating fluid ; a dorsal, an abdominal, and lateral vessels. These tubes carry red blood, and have a well-marked systole and diastole. Eight pulsations occur in the course of a minute. I have frequently placed the *H. vulgaris* under the microscope, in order to discover a central organ of the vascular system, or what corresponds to the heart, but without effect. According to the opinion of some physiologists, the several dilatations occurring in the course of the abdominal blood vessel, which, in the present instance, assume the figure of a diamond, (a portion of which is seen, magnified, in Fig. 5.) answer very effectually this purpose.

The food of the *H. vulgaris* consists of the smaller kind of earth-worms, &c. which, in like manner with the *H. sanguisuga*, it swallows whole.

In the summer of 1815, I kept several of these animals, in order to discover their mode of propagation. Examining the vessels that contained them, from time to time, I found them to be oviparous: the ova being enveloped in a gelatinous mass, surrounded by a firm membrane, to which we attach the term of capsule. These ova I preserved many months, but they proved unproductive. Disappointed in this my first attempt, I resolved to continue my research, and again collected during the last summer, a considerable number; when the object I had in view, was fully attained.

About the middle of June, several capsules were deposited. As some of them were transparent, I had an opportunity of examining their contents. I could distinctly observe the ova in them; then had the

satisfaction of identifying animal existence ; and ultimately, of tracing the young from this period to their exclusion.

Having thus found the ova productive, I examined the vessel daily, with a view of marking the time when they were deposited, and the period required to produce the changes I have noticed.

On the 4th of August I observed a capsule, in which the ova were very distinct : on the 26th of the same month, animal existence was developed, and on the 17th of September the young were excluded. In this instance, signs of vitality were manifest in twenty-two days, and in forty-four days, the young had escaped.

On the 14th of August, another capsule was deposited, in which animal existence was evident on the 1st of September, and on the 24th of the same month, the young were excluded. In this case, the first sign

of life was traced in eighteen days, and the young had escaped in forty-two days.

August 13th. I observed two of the *H. vulgaris* in *actu coitus*, and found them to copulate after the same manner as the common snail. In this state I removed and kept them apart from the rest. On the following morning they had separated, when I consigned them to different vessels. One of them, shortly afterwards, escaped from its confinement, and was lost. It, however, produced two capsules, one on the 17th of August, the fourth day after copulation, and the other on the 18th; both which proved unproductive. The other Leech produced a capsule on the 17th of August, the fourth day also after copulation, and one on each of the following days: 18th, 21st, 23d, 24th, 27th, 30th, September 4th and 8th: on the 2d of October, it died. In the whole it deposited nine capsules: of these,

two only were productive. The one (17th August) indicated animal existence in twenty days (6th September), and in fifty-six days (12th October), the young were excluded. In the other (August 18th), animal existence was developed in twenty-one days (September 8th), and in sixty-days (17th October), the young made their escape. Thus, traces of vitality were manifest in each of the capsules about the same time as in those previously mentioned ; that is, in three weeks : but, from this period to the exclusion of the young, five weeks had in the latter instance elapsed, whereas, in the former, this occurrence took place in the space of three weeks. This I can only account for, by stating, that the ova deposited on the 4th and 14th of August were exposed to the sun, whilst those produced on the 17th and 18th of the same month, were kept constantly in the shade.

We shall now describe the manner in which these capsules are deposited.

When the *H. vulgaris* is about to produce one of these bodies, it is observed to be greatly contracted both above and below the uterus. After having fixed its tail, which it does not once remove during the operation, it in the course of ten minutes presents the appearance represented in Fig. 3. At first, there is no difference as to colour between the distended portion and the rest of the body; but, in a few minutes, this part becomes of a milky-white colour, from the formation of a film or membrane, into which the animal forces, with some effort, the whole contents of the uterus. This done, the *H. vulgaris* elongates the anterior portion of the body, and thus loosening the enveloping membrane, withdraws its head from it, as from a collar. In some instances, where this membrane cannot be readily de-

tached, I have observed the animal to bend back its head, and then taking it in its mouth, and drawing it gently, is thus enabled to remove it. From the first formation of this membrane or capsule, to its removal from the body, twenty minutes usually elapse. It is, at this time, very elastic, and of no determinate figure. After the *H. vulgaris* has firmly fixed it to some surrounding substance, it fashions it with its mouth, until it presents an oval form, such as is delineated in Fig. 7. It afterwards returns once or twice to survey it, when all farther notice of it ceases.

The accuracy of this statement may perhaps be questioned. It may be considered as highly improbable, that the capsule should be deposited after this manner. Strange, however, as it may appear, I have several times witnessed the Leech drawing the anterior part of its body through it, as through a ring. Indeed, I know of no

other way in which it can possibly get rid of it, *the membrane forming a complete band round its body.* Although this mode may be somewhat singular, yet there is little in it to excite our surprise, in comparison with what we find recorded in the works of naturalists.

When deposited in an unattached state, that is, left free, and floating in the water, the capsules are mostly of a globular form (as in Fig. 6). When fixed to any substance, they present an oval form (as in Fig. 7), which is by far the most common. They are at first of a greyish-white colour, *a a*, but in ten or fifteen minutes become of an amber colour, *b b*. They differ much as to size, but are usually about three lines in length, and two in breadth, convex above and flattened beneath. The dark points (Fig. 8, *a a*) mark the openings left in the capsule by the manner in which the Leech deposits it, and are those places from which

(the resistance there being less than in any other part) the young escape. They are deposited during the whole of the summer months, and even so late as the month of October (29th), and contain each from six to twelve ova ; which are well defined as to figure, being perfectly round, and have a smooth uniform appearance. The ova, and the enveloping membrane are represented, magnified, in Fig. 8. In about a fortnight the ova are much increased in size, and show rough edges (Fig. 9.) In three weeks they take the form of an oblong oval (Fig. 10), when animal existence is, for the first time, developed : which consists, in simply an elongation and contraction of the body. At this period, there is little or no resemblance to the parent animal. In six weeks, the young are completely formed, and in active motion about to quit the capsule. Fig. 11, shows the included young at this period.

It is not a little amusing to witness their exertions to escape from their imprisonment. They contract themselves, as it respects their length, into as small a compass as possible, and then forcibly push forward the head, butting, as it were, at the dark point of the capsule, to effect their escape. After many efforts, they succeed in making a small opening, through which they endeavour to force a passage. I have frequently watched them, the head having free motion without the capsule, using their utmost exertions to free themselves, but not being able to accomplish this, they have returned to their former situation, renewing their efforts occasionally, until their object was attained.

At the time of birth, they are nearly colourless, and continue so for many months, with very little increase as to size. They have the property of moving on the surface of the water, with their belly uppermost. I

have noticed nothing of this nature in these animals, when fully grown. According to MULLER, this faculty is possessed by the *Hirudo hippoglossi*: he says, “Præter hunc incessum (more geometrarum) alium in hac specie observavi, inversum nempe, dum corpore supino, summum aquæ ore et cauda, alternatim prehendit.” Hist. Verm. ii. p. 51. I have observed it to be also common to the *Hirudo stagnalis* and the *Hirudo complanata*. These animals, differing in several particulars from the Leech, are now formed into a distinct genus; to which, from their possessing a retractile tubular tongue, we have given the name of GLOSSOPORA.

Considering the quantity of the *H. vulgaris* that I preserved, during the summer, I was surprised at the comparatively small number of capsules deposited. This was at length accounted for. Whilst watching

one of them, during the formation of this membrane, I observed another move forward towards the same place, seize it in its mouth, and tear it into three or four shreds, which it left floating in the water.

I now placed the *H. vulgaris*, singly, in different vessels, and found I could by this mode increase the number of the capsules. Each Leech produced, in less than a month, from six to twelve. One of them deposited, from the 8th of October to the 29th of the same month, no less than twelve capsules, and taking an average number of the ova they contain, and supposing only one-third to be productive, we should have thirty-six young from this single Leech.

From the similarity of the *Hirudo vulgaris*, both in its structure and general appearance, to the *Hirudo medicinalis*, I think, we have every reason for believing that the latter is also oviparous; and that the ova have an

enveloping membrane, which is formed and deposited, after the manner already mentioned.

From what has been advanced, we learn,

1. That the *Hirudo vulgaris* copulates in the same manner as the common snail.
2. That it is oviparous.
3. That the ova are imbedded in a gelatinous mass enveloped by a strong semi-transparent fibrous membrane, denominated the capsule.
4. That the capsule contains from six to twelve ova, which are globular, and have a smooth surface.
5. That these ova, in the course of a fortnight, lose their globular shape, and show jagged edges : that in three weeks, they take the form of an oblong oval, when we discover animal existence : and in six weeks, the young make their escape.

6. That the number of the capsules each Leech produces (one every second or third day), varies from six to twelve.

7. That the young are nearly colourless at the time of birth, and continue so for many months, increasing little as to size.

EXPLANATION OF THE ENGRAVING.

Fig. 1. A front view of the *Hirudo vulgaris*, of its natural size.

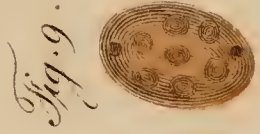
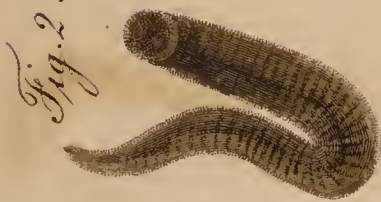
Fig. 2. A back view of the same.

Fig. 3. The appearance it presents previous to its depositing the capsule.

Fig. 4. The eyes (magnified) showing their arrangement.

Fig. 5. A portion of the abdominal blood-vessel, magnified, showing its diamond-figured dilatations.

Fig. 6. The globular form of the capsule,



when unattached, (of its natural size).—*a*, its appearance at the moment of deposition : *b*, the appearance it afterwards assumes.

Fig. 7. The form of this membrane (also of its natural size) when attached to any surrounding body.

Fig. 8. The capsule, magnified, showing the included ova, (*a a*) the points from which the young escape.

Fig. 9. The appearance of the ova at the end of a fortnight.

Fig. 10. The ova at the expiration of the third week, when animal existence is first observed.

Fig. 11. The appearance of the young at the termination of the sixth week, when they are about to quit the capsule.

OBSERVATIONS
ON THE
HIRUDO COMPLANATA, AND HIRUDO
STAGNALIS,

NOW FORMED INTO A DISTINCT GENUS, UNDER THE NAME,

G L O S S O P O R A.

Read before the ROYAL SOCIETY, June 26, 1817.

I BEG leave to lay before the Society, a few remarks on the *Hirudo complanata* and *Hirudo stagnalis*; animals that have been hitherto, but injudiciously, retained in the genus HIRUDO.

From the circumstance, in which they differ more particularly from the Leech, they are now formed into a distinct genus, under the term of *Glossopora*.

These animals resemble the Leech,

a. In the body being furnished with a series of rings.

b. In locomotion being effected by the alternate attachment of the head and tail.

c. In the division of one general stomach into several lateral cells or partitions.

These animals differ from the Leech,

a. In the mouth being furnished with a projectile tubular tongue.

b. In the body being nearly flattened, and pyriform.

c. In having an abdominal pouch, or cavity, for the reception of their young.

The genus which they now form, takes the name (from γλῶσσα, a tongue, and πόρος, an aperture) of

GLOSSOPORA.

CHARACTER GENERIS.

Corpus subovatum, depressum, caput acuminatum, lingua tubulata resiliens, os caudamque alterne affigendo progrediens.

G. tuberculata: Glossopora dilatata, supra cinerea linea duplici tuberculata, subtus grisea, atomis nigris innumeris.

LINNÆUS. *Syst. Nat.* XII. 2. p. 1079.
n. 6.

———— *Faun Suec.* 2082, *Hirudo depressa ovato-oblonga interaneis fuscis pinnatis pellucetibus.*

HILL. *Hist. Anim.* p. 16. *Hirudo lateribus attenuatis.*

BERGMANN. *Act. Stockh.* 1757, Tab. 6.
Fig. 12, 14. *Hirudo sexoculata.*

MULLER. *Hist. Verm.* 2. n. 157, p. 47
Hirudo complanata.

G. punctata : *Glossopora gracilis*, cinereo-viridis, punctis plurimis subnigris.

LINNÆUS. *Syst. Nat.* XII. 2. p. 1079.
n. 5.

———— *Faun. Suec.* 2081. *Hirudo*
(stagnalis) depressa nigra,
abdomine subcinereo.

BERGMANN. *Act. Stockh.* 1757, n. 4,
Tab. 6. Fig. 9—11. *Hirudo* binoculata.

MULLER. *Hist. Verm.* 2. n. 171. p. 41.
Hirudo binoculata.

I am of opinion, that the *Hirudo circulans* described by Mr. SOWERBY*, and the *Hirudo crenata* by the Rev. WILLIAM KIRBY†, belong to this genus ; but having had no opportunity of seeing either, I cannot determine whether or not they possess the tubular tongue.

* British Miscellany, Tab. 76.

† Linn. Trans. vol. ii. p. 316.

The *Hirudo Ilyalina*, which, MULLER observes, has a flattened body, and carries its young in a pouch, and the *Hirudo tessulata* of the same author, will, I think, also be found, upon examination, to belong to this new genus.

The tubular tongue very seldom falls within our view; hence our surprise is the less, that it should so long have escaped notice. At the time I first observed it, I was unacquainted with any author who had mentioned it. On my referring, however, to BERGMANN'S account of the *Hirudo serocolata*, (now *G. tuberculata*) I find it there noticed, not as a tongue, but as a slender body, of a whitish colour, occasionally projected from the mouth; of the use of which he confesses himself to be ignorant. I give his words, “*Utur munnen har jag åtskille gånger sett utrackas en blek, smal lem, hvars mytta är mig obekant**.” MUL-

* Stockholm Transactions, for 1757, p. 313.

LER mentions that he never witnessed (although he frequently looked for it) the body which BERGMANN saw the *Hirudo sexoculata* thrust from its mouth: but he once observed the *Hirudo vulgaris* protrude a similar organ, when, he says, this assertion of BERGMANN came across his mind. On his observing it, however, more narrowly, it proved to be a small aquatic worm that the animal had swallowed and afterwards rejected. This readily accounts, he adds, for the mistake into which BERGMANN has fallen.

In stepping forward to support BERGMANN, I am only doing an act of justice to the merits of an accurate and intelligent observer.

Having had the *G. tuberculata* and *G. punctata* under my daily notice for a period of at least six months, I may, I presume, speak with some decision on this point. It may seem perhaps unnecessary to add, that I possess an elegant preparation, showing

this tongue (protruded from the mouth) filled with mercury. It is of a cartilaginous structure, and admits of great flexibility. It is in length about one-eighth of an inch, and is seen, delineated (magnified) in Fig. 5.

The *G. tuberculata*, is about half an inch in length, but when fully extended, one inch. It is commonly found in rivulets, attached to pieces of wood, stones, &c. A delineation is given of its natural size, in a front and back view, in Fig. 1, 2, 3, 4. It possesses great transparency, and has a fine glossy vitreous appearance. It is convex above, flattened beneath, and somewhat resembles a compressed pear, the tail being very broad, and the head tapering towards the extremity, in which may be seen six eyes, (Fig. 9. *b*) disposed in two longitudinal rows. The sides or margin of the body are serrated. The back is usually of a brown colour, with lighter or darker patches, orna-

mented in the middle with a double longitudinal row of white tubercles. (Fig. 9. c.) These tubercles are connected together by two black longitudinal lines, and are seldom apparent, unless the animal is at rest. The belly is generally of one uniform colour, chiefly grey, with a slight double black line running longitudinally in the centre.

When this animal is in motion, (to which it is much averse, seldom quitting the spot on which it may be affixed,) it is observed to throw forward its head to the greatest point of extension, and then attach itself by means of the sucker terminating that extremity. Thus securing its hold, it draws up the tail, when the back describes an arch, as in Fig. 6. The tail is then fixed by a similar sucker, and the head is again extended. Now and then it supports itself by the tail, the head waving to and fro, and occasionally buries its head under the abdomen, some-

what after the manner of an *oniscus*. This is seen in Fig. 7.

The *G. punctata* is much smaller than the above, and exceedingly delicate in its structure. On the head, we notice two eyes, placed transversely (Fig. 13. *b.*) It is delineated of its natural size, in Fig. 11, 12. Both the back and belly is of a dusky grey, profusely sprinkled with minute black specks.

The stomach of the *G. tuberculata*, like that of the Leech, is divided into several cells or partitions (Fig. 10. *d. e.*) with their extreme points verging towards the tail. The two last of these cells (*f*) are much longer than the rest, and terminate in two blind sacs. Between them, we notice the intestine, a tortuous tube extending to the anus, (Fig. 9. *e.*) a foramen above the rim of the circular sucker, or what constitutes the tail.

These animals, it has been asserted, when

cut, or divided, are capable of reproduction, but this seems to rest on no just foundation.

Their food principally consists of the *water helices*, and here we see the great use of the projectile tubular tongue. The animal, from its tapering so much towards the head, is enabled to penetrate some considerable way into the hollow of the shell, and from the flexibility of its tongue, can follow its victim to the innermost recess of its habitation. A passage from MULLER, upon this subject, may not be devoid of interest. “Spectaculum singulare præbuit hujus (*G. punctata*, olim *H. bioculata*) cum limace *Planorbis* conflictus : limacem ore prehendere molitur hirudo ; ille se quam citissime cum strepitu ex aeris et aquæ subitanea pressione orto testa condit. Hirudo oram aperturæ tentare pergit, at *Limax* insidias sentiens, seque in domuncula hunc contra hostem minus tutum credens, animum capit, egreditur et festinanter ad summum vasculi

marginem prorependo ex aqua aufugit. Miratu dignus *Limacis* instinctus salutem quærendi fuga in elementum *Hirudini* contrarium ;

Omnibus ignotæ mortis timor, omnibus hostem
Præsidiumque datum sentire, et noscere teli
Vimque modumque sui.

Paucas tamen post horas, jubente natura, in aquam rursus descendere coactus, novo sese periculo obtulit, eique demum succubuit."

The *G. tuberculata*, and *G. punctata*, are oviparous ; the former producing about 50, the latter about 20 at a birth. The same appearance is observed in these animals as in the *H. vulgaris*, when they deposit their ova, that is, a contraction of the body both above and below the abdominal foramen (Fig. 8.) There is, however, this difference ; the *H. vulgaris* deposits its ova *in a capsule, formed exterior to the body*, whilst in these animals, the ova are simply excluded, held together by some gelatinous matter. From

six to twelve ova are deposited at a time. When the whole of the ova are excluded, they are received into the abdominal pouch of the parent, where they constantly remain, until their contents are fully evolved. If the ova are removed, and kept in a vessel by themselves, they do not prove productive; hence there seems to be a necessity for this parental solicitude. This pouch, or cavity, is always conspicuous in the *G. punctata*, but in the *G. tuberculata*, only at the time of its producing young. When the young are excluded from the ova, they remain attached to this cavity by the tail, enjoying a free extent of motion with the rest of the body. In this position they are represented in Fig. 7. They frequently leave this pouch, but soon return, and again affix themselves. Shortly after birth, their *interanea* are filled with a cream-coloured fluid, which, under the microscope, presents a most interesting and beautiful appear-

Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.

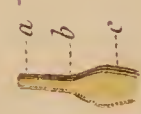


Fig. 6.



Fig. 7.



Fig. 8.

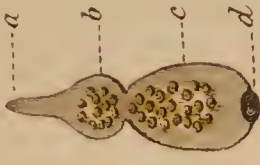


Fig. 9.

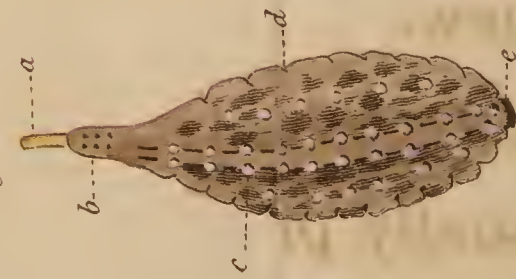


Fig. 10.

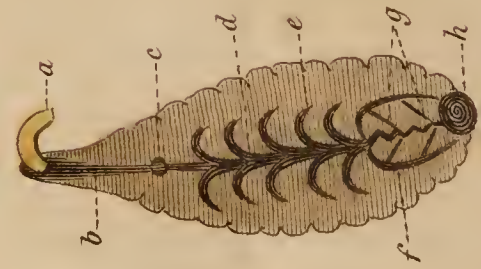


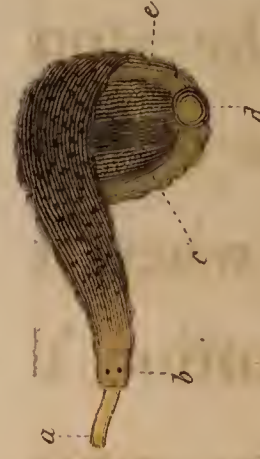
Fig. 11.



Fig. 12.



Fig. 13.



ance. Whilst speaking of the stomach of the parent animal, I forgot to observe, that the *interanea* are only visible when food has been recently taken. I mention this circumstance, that I may not be supposed to labour under a mistake, in the view I have given of this organ. MULLER himself indeed confesses, that he was a whole month (although assisted by the microscope) before he discovered it, yet he with much candour adds, that he afterwards very frequently saw it, even with the naked eye.

EXPLANATION OF THE ANNEXED
PLATE.

Fig. 1, 2. The *G. tuberculata*, natural size, front view.

Fig. 3, 4. Ditto, back view.

Fig. 5. The tubular tongue (magnified): that portion from *a* to *b* is usually protruded from the mouth, the letter *c* refers to the

root or the expanded part of the tongue, or what, more properly speaking, constitutes the œsophagus.

Fig. 6. Shows the arched back the *G. tuberculata* presents, when in motion.

Fig. 7. Shows the abdominal pouch of this animal with the young affixed to it by their tail, enjoying free motion with the rest of the body.

Fig. 8. Its appearance when about to deposit its ova; *a*, the mouth; *b*, the contracted portion containing the ova to be then excluded; *c*, the remaining portion of the ova left in the abdominal cavity; *d*, the tail.

Fig. 9. The *G. tuberculata* magnified, showing, *a*, the tubular tongue; *b*, the eyes; *c*, the double longitudinal row of white tubercles; *d*, the serrated margin; *e*, the anus.

Fig. 10. The back part of the same animal, showing, *a*, the tubular tongue projected from the mouth; *b*, the œsophagus;

c, the abdominal foramen ; *d*, the alimentary canal or stomach ; *e*, the lateral cells of the stomach ; *f*, the two last long cells ; *g*, the intestine ; *h*, the sucker, or tail.

Fig. 11. *G. punctata*, natural size, front view.

Fig. 12. Ditto, back view.

Fig. 13. The same animal, magnified, showing, *a*, the projectile tubular tongue ; *b*, the eyes ; *c*, the abdominal pouch ; *d*, the tail ; *e*, the serrated margin.

APPENDIX

TO A FORMER PUBLICATION ON THE

MEDICINAL LEECH.

APPENDIX.

Addenda

TO

THE MEDICINAL HISTORY OF THE LEECH.

To the account already given of the severe and distressing effects experienced by the French soldiers, when stationed in Egypt, from drinking muddy water, which, unknown to them, contained Leeches, we may add the following—being an extract from a Paper, having for its title, “*Observationes de Cardialgia Hirudinosa.*”—It reports the case of an individual, who, having for some time laboured under a cutaneous affection, was advised to try the Thermal Sulphureous

Waters of Baden. In his journey thither, being pressed with thirst, he could not resist drinking a little muddy water he met with. Shortly after, he felt a pain in his stomach, which continued nearly six months, the pain being at times so violent as to throw him into convulsions. He had taken, during this period, a variety of medicine, but with no decided effect. At length, after taking an emetic, he brought off five Leeches:—one of these nearly equalled in size the middle finger, the rest were comparatively small, but turgid with blood. From this moment, the distressing cardialgic pains, under which he had so long laboured, left him—but a considerable time elapsed, before he completely recovered. As the Leeches existed so long in the stomach, the Author of this Paper conjectures they must have been swallowed soon after their birth, and had attained their full size there*.

* *Ephemerides des curieux de la Nature*, 1719, p. 59.

I am aware I have before given it as my opinion,—that, if a Leech at any time reached the stomach, it could not possibly long survive there—but this, by the above case, the authenticity of which cannot, I think, be doubted, is now completely refuted. The error into which I was inadvertently led, took its rise from perusing the Experiments of Doctor Stevens on a Hussar, whom he describes as gaining a precarious and miserable livelihood, by swallowing stones and other substances for the gratification and amusement of the common people.—Among other experiments, the Doctor inclosed a living Leech, in a silver sphere, perforated with small holes, and gave it to the hussar to swallow, who voided it in about four-and-twenty hours ; when nothing was found except a black viscid miasma, the remains of the digested Leech. In this, and the case above related, there is a wide and material difference :—in that of the hussar, the Leech,

imprisoned as it was in the silver spherule, was brought into *immediate contact* with the contents of the stomach, which undoubtedly destroyed it; in the other instance—the Leeches, left free and uncontrolled in their movements, could withdraw from any thing unpleasant by affixing themselves to the upper portion of the stomach—thus avoiding what might otherwise ensure their total destruction.

I cannot here but revert to the very remarkable circumstance attending my experiments, fully confirming what is above asserted—that of one Leech (*H. vulgaris*), *actually living within the body of another Leech* (*H. sanguisuga*) nearly three days; and when again restored to its proper element, swimming about, apparently unconcerned as to what had happened.

The Leech of Ceylon proving so incessant and tormenting a plague to travellers in that country, and the symptoms following

its bite being not only alarming but really dangerous—amputation of the wounded extremity being in many instances absolutely required—it has not been considered uninteresting to extract from Dr. Davy's work, recently published, the following account of this singular creature. The Leech of Ceylon varies much in its dimensions; the largest are seldom more than half an inch long, in a state of rest; the smallest are minute indeed. It is broadest behind, and tapers towards the fore-part above, it is roundish; below, flat. Its colour varies from brown to light brown; it is more generally the latter, and rarely dark brown. It is marked with three longitudinal light yellow lines, extending from one extremity to the other; one dorsal and central; the two others, lateral. The substance of the animal is nearly semi-transparent, and, in consequence, its internal structure may be seen pretty distinctly. A canal appears to

extend centrically the whole length of the body, arising from a crucial mouth at the smaller extremity, and terminating in a small circular anus at the broader extremity, on each side of which are two light spots.

“ This Leech is a very active animal : it moves with considerable rapidity ; and it is said occasionally to spring. Its powers of contraction and extension are very great ; when fully extended, it is like a fine cord, and its point is so sharp, that it readily makes its way through very small openings. It is supposed to have an acute sense of smelling, for no sooner does a person stop where Leeches abound, than they appear to crowd eagerly to the spot from all quarters. This animal is peculiar to those parts of Ceylon which are subject to frequent showers ; and consequently it is unknown in those districts that have a long dry season. It is most abundant amongst the mountains—not on the highest ranges, where the

temperature appears to be too low for it, but on those, not exceeding two or three thousand feet above the level of the sea. It delights in shady damp places, and is to be seen on moist leaves and stones more frequently than in water. In dry weather it retires into the close damp jungle, and only in rainy weather quits its cover, and infests the pathways and roads, and open parts of the country.

“ Whether it is found in any other country than Ceylon, is not quite certain: perhaps the Leech of the mountainous parts of Sumatra, noticed in Mr. Marsden’s History of that island, is similar to it; and it is not unlikely, that it occurs amongst the damp and wooded hills of the South of India. Those who have had no experience of these animals,—of their immense numbers in their favorite haunts,—of their activity, keen appetite, and love of blood, can have no idea of the kind and extent of annoyance they

are to travellers in the interior, of which they may be truly said to be the plague. In rainy weather, it is almost shocking to see the legs of men on a long march, thickly beset with them gorged with blood, and the blood trickling down in streams. It might be supposed, that there would be little difficulty in keeping them off; this is a very mistaken notion, for they crowd to the attack, and fasten on, quicker than they can be removed. I do not exaggerate when I say, that I have occasionally seen at least fifty on a person at a time.

“ Their bites too are much more troublesome than could be imagined, being very apt to fester, and become sores; and, in persons of a bad habit of body, to degenerate into extensive ulcers, that in too many instances have occasioned the loss of limb, and even of life.

“ The instant the Leech fastens on, an acute pain is generally felt, like that pro-

duced by the bite of the Medicinal Leech. A few hours after the bite, the surrounding skin becomes slightly inflamed, and itching of a very tormenting kind commonly occurs, producing such a desire to scratch, that few have resolution enough to resist, though well aware of its aggravating effect. This itching may continue several days, till either the wound has healed or ulcerated. The former termination is most common, if only common precautions be taken, and provided the habit of body be pretty good."

Addenda

TO

THE NATURAL HISTORY OF THE LEECH.

Two new species of the Leech-genus have been described by M. Guyton and Le Martiniere :—the former informs us, that those he found were lodged in the nasal fossæ or cavities of a heron, (*Ardea virescens*) in the island of Martinique—but if this, he adds, be the constant residence of that worm, the fact would be remarkable ; as we are acquainted with no other species of Leech that lives constantly in the interior of other animals. This fact, however, is not so very singular as he would make it out to be ; for the Leech, Le Martiniere describes,

(who, as naturalist, accompanied Perouse in his Voyage of Discovery) was found buried about half an inch in a shark's liver. It was something more, he says, than an inch in length, of a whitish colour, and composed of several rings, similar to those of the *tænia*. The superior part of its head was furnished with four small ciliated Mamillæ, by which, it took its food. In the form of these *instrumenta cibaria*, it very nearly resembles the animal, which has been supposed to be the cause of measles in swine*. From the description here given, this animal cannot, I think, with any reason, be referred to the genus *HIRUDO*. It is very probable those described by M. Guyton, rest upon the same doubtful tenure—be this as it may, as these animals have been described under this genus, it would have been ill-treating

* Encyclopedia Britannica—Supplementary Number—
Art. *Hirudo*.

these authors, had I passed their account by unnoticed.

It has been stated, on the authority of a French clergyman, to whose experiments I have before alluded, that Leeches predict changes in the weather, with such accuracy, as to entitle them to be considered as useful barometers. This statement would seem corroborated by Cowper the poet, who asserts that, “ Leeches, in point of the earliest intelligence, are worth all the barometers in the world.”—Bomare, desirous of ascertaining how far these remarks were just, enclosed three Leeches, in a vessel, which he placed on the 7th of May, in a window, having a northern aspect. One of them, he observes, was out of the water the whole of that day, steadily affixed—the other was continually swimming about—and the third, was in motion at the bottom of the water. From this and other experiments, he says, “ Il m’a paru, que les Sang-

sues de Chantilly, ne se comportaient pas régulièrement dans l'eau, comme celle du Curé, des environs de Tours. Quelquefois, les mouvemens de mes Sangsues, n'avaient aucun rapport entre eux, et, si je ne me trompe, il n'est pas possible d'en tirer des resultats absolus. Je conclus donc, que le *barometre de Sangsue*, a été proposé, sur un fait, sinon précaire, au moins isolé*."

Bonnet, the celebrated Genevese naturalist, has stated, that if Leeches do not prove good barometers, they may at least be regarded as very delicate thermometers: for as often as he applied his finger to the outside of the bottle on the spot where the Leech was affixed, it altered its situation, and this took place, whether the Leech was in the water or not. Is it not, however, more reasonable to suppose, that the Leech quitted its station on the approach of any

* Dictionnaire Naturelle, Art. Sangsue.

foreign body, than that it should be so sensibly affected by such a slight increase of temperature?

It has been observed, that fish, frogs, &c. whose fluids they suck, constitute the chief food of the Medicinal Leech; an animal, that as far as I have been enabled to remark, never takes solid aliment. In this respect it differs widely from the Horse-Leech—although in external configuration and anatomical structure, there is scarcely any perceptible difference between them. If further proof were wanting of the Medicinal Leech feeding upon frogs, fish, &c. we have it in Vitet. I placed, says this author, eight strong lively Leeches, with a frog, in a vessel filled with water;—the moment the Leeches came in contact with the frog, the latter bounded with great rapidity from one extremity of the vessel to the other. After the lapse of about a month—the water being, in the interim, changed every second day—

whether it so happened, that the Leeches were accustomed to this sort of combat, or that the frog had lost its vivacity, two Leeches suddenly attached themselves to its back, and sucked its blood, when it speedily perished. Vitet afterwards placed a Gold Fish (two inches in length) in a vessel, filled with water, adding, at the same time, six sprightly Leeches. The fish, in a very short time, attacked the Leeches, particularly those resting at the bottom of the water. For a few days, the Leeches regarded this fish with a sort of dread, cautiously avoiding any contact with it—but, as it did not cease to harass them, it was, at length, bitten in the mouth, whilst in the act of seizing a Leech by its head. This bite rendered it afterwards exceedingly timid, for it no longer attacked the Leeches with its wonted courage. Should the Gold Fish be bitten either in the mouth or eye—the only parts where it is exposed to the attacks of the

Leech—and be unable to shake off its antagonist, it rarely happens that it does not fall a victim. But, if it be well fed, and fresh water given it frequently, it will live with the Leeches, one or two months, or perhaps more, without sustaining the least injury*.

It has been remarked, that those animals which are lowest in the scale of existence, support for the longest time abstinence; as is frequently the case with those that take a great quantity of food at a single meal. Plempius says, this is the case with Leeches; he has known them to exist three years in water, without any other nourishment*.

When we take into account, the very enormous stomach of the Leech, which occupies nearly the whole of its internal cavity, being capable of containing from half an ounce to an ounce of blood, and consider

* *Traite de la Sangsue Medicinale*, p. 187.

† *De Valetud. togat*, p. 237.

that this fluid is received into several cells or partitions, over which the Leech has perfect controul, only allowing so much nutriment at a time, to pass into the alimentary canal, as is just sufficient to preserve its existence, our surprise is much diminished at what we have heard of its supporting such long abstinence—a term, by the bye, extremely incorrect as applied to the Leech, this animal being, for the most part (by the admirable and ingenious contrivance we have noticed), liberally supplied with a future stock of aliment. Its stomach, indeed, may be regarded as a general storehouse, upon which it can draw for food as often as its necessities require; it, therefore, if I may use the expression, *carries within itself* a supply of food, sufficiently abundant to last several years;—requiring no other notice or care to be taken of it, than, from time to time, simply renewing the water.

Upon examination, it has been found,

that the blood, even after remaining some months in the stomach, undergoes but little change, either in colour or fluidity, at least in the first eight cells. And in these—if the Leech has not for a considerable period received a fresh supply—scarcely any blood will be found, while in the lower cells, this fluid is exceedingly abundant, but of a thicker consistence than usual, and in colour of a dark red, approaching to black.

Leeches have been reported to possess the power of reproducing lost parts when divided by accidental or other causes. This has been clearly pointed out to be an error—but should any doubt still exist, I think it will be completely silenced, by the following statement:

If, says Thomas, we divide a Leech transversely, each part, however long it be preserved, so far from reproducing what is lost, will lose its vitality in a greater or less space of time:—the superior extremity never re-

generates the portion terminating the body, nor the latter the superior parts or what constitutes the head. In every instance, the wound, after a time, closes—but *there is never the slightest trace of any parts regenerated**.

According to Vitet, if we take a Leech, and cut off both its posterior and anterior extremity—taking care to renew the water every second or third day—it will, thus mutilated, (*although the amputated portions are never regenerated*) live even two years and more, scarcely diminishing in size, or losing its strength and activity †.

The general distribution of the nervous system in the Leech, this animal possessing no common centre of life, as the brain, but having it nearly equally diffused in every part of the body—sufficiently accounts for

* Memoires sur les Sangsues, p. 130.

† Traité de la Sangsue Medicinale, p. 172.

the length of time it is enabled to live, after being divided into two or more portions. Other causes may also be adduced—as—the general distribution of blood through the respective vessels over the whole body, the Leech having no central organ of circulation—the equal distribution on each side of the body, of the lateral or air vesicles—and the immense or capacious stomach, filling up or constituting the whole of its internal cavity, consequently containing a sufficient quantity of sustenance for the Leech even after being divided; this general distribution, I again repeat, of the organs—so fitted to preserve life—fully explains the singular circumstance, of a Leech living in a mutilated state, so considerable a period, although deprived of the power of reproducing lost parts, or those which are defective.

To the experiments already given, shewing the influence of the several gases upon

the Leech, I now subjoin a tabular view of the principal experiments conducted by M. Vitet.

THE MEDICINAL LEECH WILL LIVE	Days.	Hours.	Min.	Sec.
<i>In a bottle filled with—</i>				
Spring water (hermetically sealed)	15	—	—	—
Milk	2	—	—	—
Olive Oil	6	—	—	—
Olive Oil (hermetically sealed) ...	1	12	—	—
Human Blood—recently drawn ...	15	—	—	—
Serum ; obtained from human blood	20	—	—	—
Spirits of Turpentine .....	..	2	—	—
Wine—vin généreux .....	..	..	20	—
Brandy .....	..	..	10	—
Vinegar.....	..	6	—	—
Water—saturated with sugar	2	—	—	—
————— salt .....	..	..	30	—
<i>In Water, oz. 3—containing</i>				
Muriatic Acid, 1 drachm.....	..	..	..	15
Nitric	do.	..	..	15
Vitriolic	do.	..	1	—
Sulphate of Iron., do. ....	..	6	—	—
————— Copper do. ....	..	3	—	—

THE MEDICINAL LEECH WILL LIVE	Days.	Hours.	Min.	Sec.
<i>In Water, oz. 4—containing</i>				
Emetic Tartar, 12 grains.....	1	—	—	—
Nitre..... 1 drachm.....	..	..	30	—
Vegetable Alkali .. do. ....	..	2	—	—
Mineral..... do. ....	..	6	—	—
Volatile..... do. ....	..	10	—	—
Alum..... do. ....	..	6	—	—
<i>In Distilled Water, oz. 4—containing</i>				
Corrosive Sublimate, 2 grains ....	..	..	30	—
<i>In Distilled Water, oz. 2—containing</i>				
Lunar Caustic, 6 grains .....	..	..	3	—
In Atmospheric Air.....	12	—	—	—
— Oxygen Gas	14	—	—	—
— Carbonic Acid Gas ¹	10	—	—	—
— Hydrogen Gas	18	—	—	—
— Muriatic Acid Gas	—	—	—	—
— Oxygenated Muriatic Acid Gas ² ..	—	—	—	—
Exposed to the Vapours of Volatile } Alkali..... }	..	2	—	—
———— Fumes of Sulphur in } Combustion .....	..	.	20	—

¹ There is, I should imagine, some mistake in the time here mentioned:—I can scarcely conceive it possible, that the Leech can live in this destructive gas nearly as long a period

M. Vitet's experiments upon the Leech with the air pump, the galvanic and electrical machines—having more interest than those alluded to in the above table—I shall describe at some length.

A Leech, confined in a bottle half filled with water, was placed under the recipient of the air pump. The air was then exhausted. During this operation, it appeared extremely restless, moving continually from place to place. Bubbles of air then proceeded from the surface of its body, as

as in atmospheric air. In my experiments I found it to live only 5 hours. Another error is, I think, also committed, in the time (18 days) the Leech is stated to exist in hydrogen gas—being six days longer than in atmospheric air, and four days longer than in oxygen gas.

² The Leech is found to die, almost immediately, when submitted to this and the preceding gas.—The dead Leech will, according to Vitet, remain several years in a vessel filled with this gas, without undergoing any other alteration than the disappearance of the different colours in the integuments;—hence, he observes, this gas may be employed with great success in the preservation of dead animals, particularly insects, &c., whose colours we are not fearful of destroying.

well as that of the water. Each time the pump was put in action, the Leech kept its head out of the water—at other times, there was scarcely any sensible difference between this and other Leeches exposed to a free and pure air. From the 1st to the 12th day, it underwent no alteration, unless when the vacuum was made, when, as before remarked, it partly quitted the water. Being placed on the 13th day in a vessel with other Leeches, it was found to enjoy equal health and activity. The privation of air, therefore,—so fatal to the life of a multitude of animals—does not seem much to affect Leeches, when exposed in water to the influence of the air pump. It is true, as Vitet justly observes, that the vacuum produced in this machine—however well it be constructed—is never complete. It is also absolutely necessary, that it should be put in action at least every two hours, if we wish to sustain an equal vacuum. The small

portion of rarefied air even then remaining under the recipient, is amply sufficient, it appears, to keep up the life, health, and vigour of the Leech.

M. Vitet took a strong active Leech, and submitted it, in as dry a state as possible, to the action of the air pump. In a few moments it extended and contracted itself, giving off a few bubbles of air, which adhered but an instant to the epidermis. After discharging a considerable quantity of mucus, it remained motionless, adhering to the sides of the glass by its head and tail—its body being, here and there, much swollen. Now and then a little blood passed off from its mouth. As the surface of its body became dry, it moved about with greater difficulty ;—on the fourth day, it extended itself at full length, with scarcely any perceptible motion, and on the fifth, it died. It thus dies in this way six or seven days sooner than a Leech placed in a bottle free from

moisture—yet exposed to pure and free air—its death depending not altogether upon the privation of air, but upon the loss of the moisture, within and without its body, which is removed, at the same time, with the air by which it is surrounded.

Upon submitting a strong healthy Leech to the action of the galvanic pile, it is observed to draw itself up into the form of a circle; the mouth is drawn in, and the extremity of the tail becomes so contracted, as to form a sort of cupping glass. If this experiment be a long time continued, the Leech remains in a state of contraction—hard and motionless—but left for a few moments untouched, it begins to extend itself, and gradually recovers. On being replaced in the water, it exhibits great languor, but in a short time returns to its natural and usual condition.

When a Leech is submitted to the electrical machine, and sparks are drawn from

its body, it is at first seen to vomit blood—then to contract itself:—after receiving a considerable number of sparks, its life becomes extinct. It dies more rapidly when submitted to slight electrical shocks. On the discharge of a Leyden phial, it dies immediately, greatly contracted and indurated.

Durondeau kept Leeches under an exhausted receiver for several days: he informs us, they sustained little or no inconvenience from their imprisonment. He afterwards divided four Leeches, transversely, and placed them in a similar situation, (taking care to exhaust daily the little air which might enter.) He found the anterior extremities to pass in and out of the water, as entire Leeches;—but the posterior extremities did not quit the bottom of the vessel during the eight days they were submitted to the experiment. A similar trial was also

made with four Leeches, divided longitudinally :—none of these portions, however, quitted the water, either before or after the exhaustion of the air, although they still preserved their vitality. Leeches, he observes, never take food when under the exhausted receiver. A few Leeches, regaling upon the recent blood of a chicken, immediately quitted their repast upon the air being exhausted ;—on allowing it to re-enter, they again put themselves in motion, each time quitting their food the moment they were deprived of air*. From the experiments of Bibiena, before alluded to, it appears, that Leeches will endure a great degree of cold without endangering their life. The result attending the experiments of M. Dubuc, sen. apothecary at Rouen, fully establishes this point. This gentleman has seen Leeches,

* Journal de Physique, 1782, p. 289.

after being frozen or encased in ice more than a month, restored to life, on melting the ice gradually, and with due precaution. He has even, afterwards, employed them medicinally *.

* Journal Des Pharm. 4to. p. 416.

Addenda
TO
THE ANATOMICAL STRUCTURE OF
THE LEECH.

I have noticed, in my remarks on the external anatomical structure of the Leech, only three foramina (the mouth excepted) two on the belly, termed generative ; and one on the back—*the anus*—the existence of which had been again and again disputed. I have now to mention a fourth foramen, which is thus described by Vitet, whose remarks on the anatomical structure of the Leech are exceedingly accurate, forming by far the most interesting portion of his Treatise. The dorsal foramen, situated upon the brown band which occupies the middle and runs

along the back, is nearer the tail than the head, but only becomes visible by plunging the living Leech in the essential oil of turpentine. The borders of this aperture then become elevated, representing a sort of mamelon or teat, opened in its centre, from which issues more or less serous matter. This aperture cannot be detected in the living Leech, even with the aid of the microscope; at least, M. Vitet has never yet been enabled, *in this way*, to perceive it; consequently, has been prevented from ascertaining with what part of the internal cavity it communicates, or what is its real office *.

The Leech has been described as possessing, among other organs relating to the senses—that of vision. Many authors, how-

* *Traité de la Sangsue*, p. 17.

ever, deny them this organ, as Thomas, Vitet, &c. Durondeau, another French author, observes, that all his efforts to discover this organ, and even that of hearing, were unavailing; but he does not hence infer, that Leeches are deficient in these organs, for upon the least noise, he remarks, they give such evident proofs of hearing, that we cannot well refuse them this faculty, nor even that of seeing, since they avoid with so much care all objects that are displeasing to them*.

Dr. Kurzmann is also of opinion, that Leeches have no organ of sight: he admits that these animals have, on the upper part of the head, those black projecting tubercles I have denominated eyes, but he thinks they have little to do with this office. He regards them as mere organs of feeling, observing, in support of his opinion, that Leeches do not

* Journal de Physique, 1782, p. 289.

betray the least sensibility to, or are in any way affected by light*.

Mr. Price, the ingenious author of a treatise on the Leech, considered as a medicinal agent, after a few remarks on Dr. Kurzmann's opinion and my own, observes, that "he should not have been betrayed so far into any part of the anatomical structure of the Leech, but to mark the discrepancy in the opinion of two authors, whose works are both highly respectable, and must necessarily influence the minds of their respective readers"—adding—that as far as his own microscopical observations have enabled him to judge, he has no doubt of the Leech possessing eyes†.

The insensibility, however, which the Leech evinces to light, by no means proves

* London Medical and Physical Journal, Vol. XLI. p. 312.

† A Treatise on the utility of Sangui-suction, or Leech-bleeding, in the treatment of a great variety of diseases, with instructions for the process of leeching, &c. &c. p. 126.

—as the Doctor would wish us to believe it does—that those tubercular bodies cannot fulfil the office, consequently cannot be the organ of vision. But to my own opinion already expressed, I shall now adduce that of the individual who has reviewed Professor Carena's monograph on the genus *HIRUDO**, with whose remarks I fully coincide.

“ On the subject of the eyes of the Leech, Professor Carena observes, that as it may still be doubted, whether the dark points placed around the anterior disk of the Leech really serve for vision or not, he has preferred designating them by the name of *ocular points* (*points oculaires*). A Leech may be often seen to elongate itself, and suddenly withdraw its anterior extremity *on coming in contact with any body*; and an individual Leech, deprived of the anterior

* Vide—Memorie della reale Accademia delle Scienze di Torino, tom. xxv. p. 273.

segments, including those supposed visual organs, was observed to be regulated, in all its movements, precisely as other perfect ones. Professor Carena conjectures that they may be of use to the animal only in obscure situations. We would venture to suggest another opinion on this subject, which is, that the eyes of the Leech may be merely adapted for the perception of light, and to regulate its movements ; accordingly, Leeches generally shun the light. There would seem to prevail a great error in supposing, that in all animals which possess eyes, the faculties of these organs must resemble the human eye, or speaking more generally, the eyes of the higher orders of vertebral animals. Yet experience, as far as it goes, proves, that the mole, and many molluscous animals, form no distinct perception of objects, though they are directed by the visual organs they possess, to seek or shun the light, as circumstances may require.

We feel inclined, from a variety of considerations, to think, that the ocular points of the Leech are really eyes, such as exist in some of the invertebrate animals*.

In regard to the respiratory organs of the Leech, I am, after due consideration, now disposed to admit with Sir Everard Home, Dr. Kurzmann, and others, that those organs perform this function, which I have described in a former publication, under the name of *lateral vesicles*. Dr. Kurzmann thus accurately describes them——“ The organs of respiration of the Leech are, flat, round, skinny vesicles, situated beneath the intestinal canal, sixteen on each side, lying at equal distances from each other. They

* Edinburgh Journal of Science, conducted by D. Brewster, LL.D. No. I. p. 169.

mostly contain a proportionate quantity of a white fluid, which is miscible with water. Mercury introduced into these vesicles, neither proceeding nor being capable of being forced back through the external opening, it is supposed that these openings are provided with valves. As the Leech, to all appearance, respire in the same manner as fishes do, and of course water enters the vesicles, where it remains until the air contained in it is decomposed, it is very probable, that the Leech then opens these valves to let the water run out. The respiratory organs, therefore, deserve rather the appellation of gill-bags, than that of tracheæ*.”

What induced me to suppose these vesicles had no connexion with the respiratory function, was, the circumstance of my having noticed to issue from them, from time to time, a slimy fluid, which seemed to serve

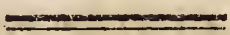
* London Medical and Physical Journal. vol. xli. p. 480.

no other purpose than that of lubricating the surface, thus preserving the pliability and elasticity of the numerous rings, in the due extension and contraction of which, as I have before said, the locomotive power of the Leech is lodged.

We now come to make a few observations on the Teeth, or what have been denominated piercers. It has often been a matter of surprise, that the Leech should be enabled to inflict a wound with such instruments, which, being entirely of a cartilaginous nature, seem little fitted for this office. This very circumstance has given birth to the opinion—erroneous as it is, and sufficiently proved so by what has already been advanced upon this subject—of the wound being produced by suction alone. Poupert supports this opinion, and from what

Dr. Kurzmann has stated, this, it would seem, is his opinion also. He observes, that he has never perceived in the teeth of the Leech, even in a dry state, such a degree of hardness, as to allow of their puncturing the skin, and for this end, he adds, they are likewise too small and slender. Vitet remarks, that it cannot but excite astonishment, that the teeth—having regard only to their anatomical structure—should effect any opening in the skin; but, if we reflect upon the size of the muscles which regulate their movements, the strong muscular apparatus which is lodged in the upper part of the œsophagus, the form and cutting sharp edge of the teeth, which resembles that of canine teeth—and the time the Leech occupies in penetrating the skin, this astonishment will be considerably diminished. I have before remarked, that these piercers are in continual vibration both in effecting the first incision, and in afterwards clearing the

passage of any coagulum that may form, and thus obstruct the free ingress of blood into the œsophagus. Many authors are, notwithstanding, of opinion, that the Leech withdraws its teeth immediately after piercing the skin. Durondeau is of this number: hence, he says, the fear which many individuals entertain, lest the teeth should remain in the wound—as in the case of Messalinus, recorded by Pliny, which terminated fatally—is without any just or reasonable foundation.



I have described the circulating or vascular system of the Leech, as consisting of a ventral, dorsal, and two lateral blood-vessels, carrying red blood, and having a well-marked systole and diastole; without any central organ, or what answers to a heart, although an organ of this nature has been

described by Durondeau*. This author has doubtless taken something else for the heart, since he is the only individual who states that the Leech possesses one. Virey has been equally unsuccessful with myself in tracing this organ, but he remarks, that the arteries possess an irritability which completely supplies the place of the heart†.

No heart has yet been traced in the common earth-worm; the power of propelling the blood to various parts of the body, being lodged in the muscular coat of the arteries alone, as in the Leech. From the peculiarities observable in this respect, that is, in the mode of distributing the vital fluid, more particularly in the lower order of animals, Sir Everard Home has been led to propose a new classification, founded entirely upon this singularity. From the paper, in which he gives an account of the

* Journal de Physique, 1782, p. 287.

† Ibidem, tom. 4, p. 413.

circulation of the blood in the class Vermes, of Linnæus, &c., (vide Philosophical Transactions, 1817, p. 1,) I copy the following extract.

“We are not, in my opinion, furnished with a sufficient stock of materials in comparative anatomy, to make out a correct arrangement of the whole system of nature, nor do I know the best plan upon which it can be made; but, at present, I look upon the circulation of the blood, and the mode of ærating it, as one liable to the fewest objections.

“The brain and nerves, as they are the most essential organs in the animal economy, appear to have a prior claim; but the difference of structure in those organs, and in the spinal marrow, is too small to serve for this purpose.

“The heart and blood-vessels are the parts next in importance, and necessarily vary more in their structure, so as readily to

give characters to a greater number of classes, which is a great advantage. I have made these remarks from a desire, that the science, to which I have devoted much of my attention, should be pursued by those who engage in it, in the manner most likely to bring it to perfection, which is, by submitting to the drudgery of making out the structure of animals not yet known,—(in this respect I perfectly agree with Sir Everard)—instead of grasping at the whole system, so many parts of which we are unacquainted with.

According to the proposed classification, Sir Everard divides the vermes of Linnæus into the following orders :

1. Those animals in which there is a heart.
2. Those in which there is no heart, but external organs of æration.
3. Those in which the circulation is carried

on by the arteries and veins of the body, there being neither heart nor external organs of æration.

4. Those in which the blood does not circulate, but in which an undulation is kept up—a circulation for the purpose of ærating the blood being rendered unnecessary, as the ærating organs consist of air-tubes that ramify through every part of the body—and

5. Those in which neither circulation nor undulation can be demonstrated.

The classification of animals, I may remark, however ingenious it be, founded upon a view of any part of their internal organization, must at all times be comprised within a very limited range: it, for instance, can never be made to apply to animals of diminutive size, from the scanty knowledge we are ever likely to gain of their internal anatomical structure:—but

we are wandering from our present consideration—that of the blood-vessels in the Leech. Although only four blood-vessels have been enumerated, yet the branches proceeding from these are highly numerous ; indeed, the integuments so abound with them, that when properly injected, they present, under the microscope, one of the most beautifully reticulated appearances imaginable—equalling, in this respect, blood-vessel preparations of the human subject. An easy mode of procuring a preparation of this kind is thus given by Dr. Kurzmann : “ If an hungry Leech, void of blood, is killed by means of alcohol, the course and ramifications of the blood-vessels become visible ; the reddish fluid contained in them, congealing into a wax-like mass by this process. On opening the Leech some hours after, the vascular system and its branches are seen, as if injected with wax.”

The blood-vessels of the Leech, that is, the four principal ones, have, as has been observed, a well-marked systole and diastole. This Vitet denies, for however attentively he examined Leeches by the microscope, and however minutely he dissected them, he has never been able to trace any such movements as those described. Thomas remarks otherwise. Speaking of the lateral blood-vessels, he observes, that we can even see with the naked eye these movements, which are very analagous to those we remark in the arterial vessels of red-blooded animals. They occur with great slowness, only seven or eight pulsations occurring in the minute. It is very remarkable, he adds, that these movements should exist independently of any central organ of the vascular system, not the slightest trace of a heart being evident, either simple or compound. This fact, for which we stand indebted to

comparative anatomy, fully establishes the truth of what was advanced by Galen—that the arterial vessels enjoy, by a power peculiarly their own, that is, unconnected with the action of the heart, the property of contraction and dilatation; from whence results what is denominated the pulse. This is not the only fact, however, that can be brought forward to prove, how much the study of comparative anatomy has been enabled to overthrow the errors introduced into physiology; and I am confident, that in proportion as our knowledge in this department extends, other sciences, in connexion with this study, will be greatly benefited and improved. In the *H. vulgaris*, or Rivulet Leech, the movements of its blood-vessels are sufficiently conspicuous by simply holding the animal up to the light; and had we no other fact than this to guide us, we might, from analogy, reasonably conclude that the Medicinal Leech was similarly circum-

stanced. According to Dr. Kurzmann, the number of pulsations occurring in a minute, in the Medicinal Leech, varies from ten to thirteen: I never found them to exceed ten. About an equal number of pulsations are stated also to occur in the common garden-snail; Bradley, taking off the shell of this animal for that purpose, found that the pulsations amounted to twelve in the minute; in three hours after, eight pulsations occurred in the same space of time.

THE END.